



20. SUSTAINABLE DEVELOPMENT

20.1 NEED FOR SUSTAINABILITY

International Agenda to reduce the Carbon Foot-print

The urgent need for addressing global warming and climate change has led the international community to sign the Kyoto Protocol, which legally bound nations to reduce green house emissions by an average of 5% below their reported 1990 levels within the period of 2008 to 2012.

In mid 2009 Prime Minister formally launched India's National Action Plan for Climate Change. As part of the plan, eight National Missions are to be pursued as key components of the strategy for sustainable development. These include Missions on:

- Mission on Solar Energy,
- Mission on Enhanced Energy Efficiency,
- Mission on Sustainable Habitat,
- Mission on Conserving Water,
- Mission on Sustaining the Himalayan Ecosystem,
- Creating a "Green India",
- Sustainable Agriculture and
- Establishing a Strategic Knowledge Platform for Climate Change.

The broad intent of these Missions is as under:

1. Reduce total carbon footprint of the development
2. Reduce total energy footprint of the cities
3. Increase the green cover of the cities .

The endeavor is thus to make cities energy efficient, people friendly and ensure '**sustainable development**'.

In order to achieve these objectives, following action is being proposed in the development parameters at the local level

20.2 ALL EXISTING AND PROPOSED NEW TOWNS WITHIN THE REGION SHOULD BE "GREEN TOWNS"

- Inter State Regional Plan –all the three stakeholders i.e. Punjab, Haryana and Chandigarh have initiated coordination and are collaborating to form the vision for the sustainability and balanced development of the region.
- In keeping with one of the intents of the Capital of Punjab Periphery Act, 1952 to maintain the environmental concerns around urban agglomerations, it is once again recommended that in addition to Chandigarh's endeavour to be a Green Town, the neighbouring states should also ensure through the Inter-State Regional Plan that all existing and proposed new towns in the region are 'Green Towns'.

20.3 AN EFFECTIVE ENVIRONMENTAL MANAGEMENT PLAN FOR CHANDIGARH AND FOR THE REGION

- It is recommended that an Effective Environmental Management Plan be devised for the region including Chandigarh which includes environmental strategy, monitoring regulation, institutional capacity building and economic incentives. The proposal needs a legal framework and a monitoring committee to examine the regional level proposals/ big developments by Constitution of an Inter State high powered "**Regional Environmental Management Board**" as per the proposal of Ministry of Environment and Forests, Government of India.

20.4 CHANDIGARH'S STRENGTHS AS SUSTAINABLE HABITAT OBJECTIVE OF THE ORIGINAL PLAN

The city of Chandigarh was planned far ahead of its times with the key ingredients of the modern concepts of a **SUSTAINABLE HABITAT** as is evident from the adoption of the following CITY AND REGIONAL concepts

CITY CONCEPTS

- Sensitive site selection.
- The natural gradient of the site facilitating storm water drainage, availability of water, scenic beauty, backdrop of the hills
- Concept of Sun, Space and Verdure.
- Self sufficient neighbourhoods offering serene family life.
- Size of the sector based on walkability to enable easy access to daily needs.
- Each dwelling unit having abundance of sunlight, air, ventilation and greenery.
- Solar Passive Architecture.
- Longitudinal green belts - green lungs connecting communities and nature.
- City forests .
- The hierarchical and equitable distribution of social infrastructure, efficient circulation system-V7s aimed at enabling men and machine to seamlessly connect within the city and outside without conflict.
- The mandatory space for the pedestrian in the road sections .
- The use of natural materials for building construction.
- The orientation of buildings for comfortable indoor living and to reduce heat gain.

Regional concepts

- The concept of the periphery with the expanse of green belt surrounding the city to enable-
- Nourish the city .
- Improve the microclimate .
- Ensure regulated development around the city.
- Maintain Man Cosmos relationship.
- Enable scope for future expansion.

20.5 CHANDIGARH'S COMMITMENT TO FURTHER THE CONCEPT OF SUSTAINABILITY

To further the sustainable practices within the city recommendations for various facets of the city have been elaborated in the Chandigarh Vision and in detail in various chapters namely

Regional settings - chapter 2

Physical infrastructure - chapter 10

Open spaces and landscaping of Chandigarh - chapter 11

Ecology and environment - chapter 17



20.6 LONG TERM REGIONAL AND CITY LEVEL MEASURES FOR SUSTAINABLE DEVELOPMENT AND GROWTH OF THE CITY:

- The Chandigarh Master Plan with a vision for 2031 is being prepared for the city and its immediate periphery, wherein the challenges and the problems affecting the sustainability of the city are being attempted to be addressed holistically in the plan. Directions for future development and growth of the city as enunciated are in line with the above vision.

20.7 INTEGRATED URBAN PLANNING APPROACH:

An integrated planning approach is proposed to be adopted encompassing various facets of the city's development in terms of the following:--

- Sensitive site selection and Eco-sensitive Planning,
- Chandigarh to be declared Solar City,
- Environmental friendly management of city level services-
- Concepts of REDUCE, RECYCLE AND REUSE of water, solid waste, sewerage,
- Creating Self Sustaining Neighborhood units in terms of Power, Water and Sewage Disposal,
- City's Green -- High percentage of land dedicated to open spaces, city greens and water bodies,
- Increasing the Green Cover by Mandatory Plantation,
- Comprehensive Mobility Plan for Chandigarh and the Region.
- Efficient Transportation System,
- Eco-friendly transport system within sites,
- Promote Bicycle as a Mode of Transportation in the City,
- Construction of Green Buildings/Campuses,
- All future developments in & around the City sensitive to its environs.

20.8 CREATING SELF SUSTAINING NEIGHBOURHOODS IN TERMS OF POWER, WATER AND SEWAGE DISPOSAL

Le Corbusier's neighbourhood units mainly provide for all community facilities within a reasonable distance to make self sufficient units for the living, religious, medical recreational and cultural needs of the citizens. This concept needs to be further enhanced into a holistic vision by making the neighbourhood units self sufficient in terms of requirements of power, sewerage disposal, waste water management, solid waste management with the active participation of the community i.e. residents, shop-owners, councillors etc. The self sufficient unit can be in the form of single sector to a cluster of four sectors, depending on the existing services, layout, population density and the other green parameters to be assessed by the Engineering Wing of UT and Municipal Corporation.

- Today, advanced technology has made available compact Sewage Treatment Plants which can be accommodated within a neighbourhood and can thus eliminate the need of first carrying the sewage down south to the STP Plants at Diggian, and thereafter of pumping up tertiary water for its usage for irrigation etc. The city should preferably have localised STPs with FAB technology within large campuses and at sector level. These green communities will thus aim at zero discharge so as to help reduce pressure on the potable water.
- Similarly each house should produce solar power to be self reliant for its essential domestic needs and gradually build up surplus power generation to feed the power grid. Emphasis should be laid on roof top solar energy. Roof top Solar Photovoltaic panels should be made mandatory for all the government buildings, institutions and residential houses above 10 marlas (250 sq yds).



Solid Waste Management at the sector level/cluster of sectors to recycle waste and generate power for public utility at neighbourhood level .

20.9 WATER HARVESTING FOR CHANDIGARH

- The demand for water is growing in direct proportion to the city's growth. Rain Water Harvesting is one of the ways to protect and sustain its water resources. The Ministry of Urban Development had appointed CSE (Centre for Science and Environment) to prepare a plan for rain water harvesting at city level for Chandigarh. A report has been submitted titled "Capturing Rainwater: A way to augment Chandigarh's water resources."

Key findings of the project:

- The city taps groundwater from the deep confined aquifers, which do not get naturally recharged. **Hence recharging these aquifers is a must.**
- Tube wells are located all across the city. Harvesting rainwater from the storm water drain network to recharge confined aquifers through structures all along the network is a simple solution to access the city's endowment of rainwater.

The rainwater harvesting in the above report is to exploit the independent storm water drainage network from the very inception in the city at a sector level. This shall ensure management of the ground level depending on the local conditions and will recharge the over-exploited deep aquifers to maintain balance with increasing population density in the overall water management plan.

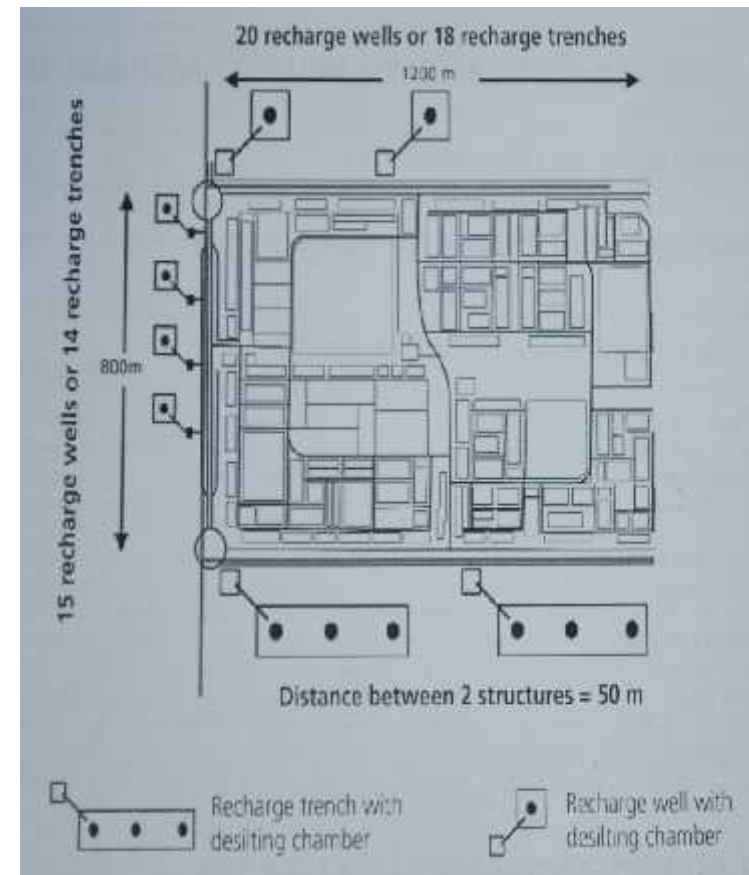


DIAGRAM OF RAIN WATER HARVESTING FOR A TYPICAL SECTOR FOR RECHARGE WELLS



Areas suitable for rainwater harvesting in the city are as follows:

- 1) **Roads and Roundabouts:** Recharge along storm water drains to both recharge rainwater as well as prevent flooding.
- 2) **All green areas:** Recharge where suitable and store where hydrogeology is not suitable. Stored water can be used for horticulture. Ponds can be constructed to harvest and use rainwater as in Botanical Garden.
- 3) **Institutional areas such as Punjab University, Capitol Complex:** Recharge where suitable and store where hydrogeology is not suitable. Stored water can be used for horticulture.
- 4) **Commercial areas:** Store in underground tanks for non-potable use.
- 5) **School, colleges and religious places:** Store and recharge stored water can be used for horticulture and other non-potable uses.
- 6) **Industrial areas and airport:** Water from roof top catchments to be stored and can be used for industrial purposes. Overflow of rooftop water can be recharged. Water from rooftops and hangers to be harvested in storage tanks to be used for non-potable purposes.

The Chandigarh Administration has already initiated the process of implementing the above mentioned report of CSE through the public health wings of the Engineering Department and Municipal Corporation, Chandigarh.

20.10 MANDATORY PLANTATION PLAN IN LARGE CAMPUSES/SITES & HOUSES

It is recommended each large campus and large house shall have mandatory tree plantation plan, duly approved to augment the city with one of the highest Green Cover in a

urban area, as found out by the Ministry of Environment and Forests, Government of India. This shall help sustain the air quality and provide the protection to local flora and fauna to attain higher environmental considerations.

All these campuses and large residential units have independent STP's & Solar Photo-Volatics of modern technology and provide zero dependence of water and power on city levels infrastructure because of increasing population. The overall principles of Reduce, Reuse & Recycle in all aspects of development needs to be adopted both at Macro & Micro level. This shall result in sustainability issues of the community development being taken to the grass root level and shall act as role model for all further community development in the country. This entire endeavour should compliment the 'Green Action Plan' prepared by the Department of Environment and Forests, Chandigarh Administration

20.11 FOLLOWING ALSO TO BE PROPOGATED:-

- The high density traffic arteries like MRTS for inter- city movement needs to be strengthened with appropriate vegetation and plantation plan.
- All heritage flora and fauna mainly spread towards the North of Chandigarh needs to be augmented and strengthened to maintain the local environment.
- Protection of natural choes outlining the peripheral area of Chandigarh grid plan i.e. Sukhna Choe and Patiala-Ki-Rao needs to be redeveloped with low density, low-rise construction, which should be sustainable in terms of its needs without depending on city level services and should emulate the model of Zero Discharge Facilities' along both the originally planned green buffers by Mons. Le Corbusier in his plan.



20.12 ADAPTATION OF GREEN RATING SYSTEMS

- Chandigarh Administration has recently adopted CWPD guidelines for placing minimum three star GRIHA rating in all public building in future by notifying has already been initiated wherein holistic vision has been taken in terms of the construction industry being monitored for environment concerns in terms of the following:
 - I. Site level measures
 - II. Material conservation
 - III. Indoor environmental quality
 - IV. Water efficiency
 - V. Energy efficiency
 - VI. General guidelines
- All the issues such as promoting ideal solar passive measures in architectural & structural design, maximum naturally lit & ventilated buildings in ideal wall, window ratios with the local low maintenance, high performance materials (including recycled material in renovation & road relaying projects) in consonance to the regional climatic conditions, minimising hard landscape & paved area (with provision of green pavers where absolutely essential), protection of top soil in construction activity, encourage terrace gardens to reduce heat island effect, adaptation of ECBC in all new construction, occupancy sensor energy, fire & water control, mandatory water-harvesting, tertiary water usages in non-potable functions, adoption of Solar City concepts thus reducing the overall carbon footprint of the future development with higher densities. This needs to be further incentivized or enforced in all private development being promoted because of growing economic activity in the region & country.

- This shall be possible by involving some NGOs/organisation, like TERI, CSE etc. to monitor and guide the Chandigarh Administration in adopting latest best technologies in every aspect of environment sustainability who shall actively participate in preparing a **Comprehensive Sustainable Plan**, monitoring its implementation and bench marking its positive features to help and receive incentives floated by Government of India in promoting Environmental Sustainability.

20.13 ADOPTION OF GREEN BUILDING CONCEPTS IN THE BUILDING DESIGNS OF THE CITY SUCH AS:

- Sensitive Site Selection.
 - Orientation.
 - Reduction of paving on the un-built site area.
 - Green roof concepts.
 - Mandating rain water harvesting.
 - Zero drainage of storm water for large development sites (>30 acre).
 - Adaptation of low energy ,locally adaptive materials, labour & technology.
- Other measures as :
- Energy Audit of Buildings.
 - Proposed Road Map to make ECBC mandatory in Chandigarh
 - Retrofitting existing government buildings to make them more energy efficient.
 - Annual waste audit report of commercial building.
 - Reduce carbon footprint due to waster to reduce waste resource to 0.4 kg/person /day



- Encourage small capacity Biomethanization Plants near source of waste – Grain Mandis /Hotels etc
- Reduce dependence on ground water by 50% and consumption of potable water .
- Promote eco park concepts across the city .
- Promoting bike tourism
- Ban on burning of leaves,
- Chandigarh as a Smoke Free City
- Controlling noise pollution
- Modernisation of dhobi ghats.



These concepts have been elaborated in the ' GREEN CODE of CHANDIGARH' proposed by the Chandigarh Administration in detail, which needs to be implemented by means of :

20.14 MANDATORY ENVIRONMENTAL CLEARANCE IN BUILDING PLAN APPROVALS & ADAPTATION OF GREEN CODE.

In order to ensure that the built environment of the city fits in harmoniously within the overall character of the city and is safe, healthy and functional and benefiting built environment, all building plans are required to be approved by the Chandigarh Administration and implemented through a well laid out mechanism.



20.15 ECO-FRIENDLY TRANSPORT SYSTEM WITHIN SITES

- All large campuses, housing complex sites shall provide eco-friendly modes of intra -site transportation. The new construction must have footpath for the streets longer than 100 m and bicycling tracks for the streets longer than 200 m. Public mode of electric driven vehicles within the site for the elderly people and people with disability should be provided. In case of new construction/re-development of such sites it is recommended that planning should be on the concept of cluster development and linear layouts be avoided to avoid large vehicular lengths.

